RAK11300 WisDuo LPWAN Module Datasheet

Overview

Description

RAK11300 WisDuo LPWAN Module is based on the Raspberry Pi RP2040 chip and SX1262 RF transceiver. It provides an easy-to-use, small-size, low-power solution for long-range wireless data applications. This module complies with Class A & C of LoRaWAN 1.0.2 specifications. It can easily connect to different LoRaWAN server platforms like TheThingsNetwork (TTN), Chirpstack, Helium, etc.

Features

- Based on Raspberry Pi **RP2040** and Semtech **SX1262**
- **LoRaWAN 1.0.2** specification compliant
- **Supported bands**: EU433, CN470, IN865, EU868, AU915, US915, KR920, RU864, and AS923-1/2/3/4
- LoRaWAN Activation by OTAA/ABP
- Long-range - greater than 15 km with optimized antenna
- ARM Cortex-M0+ Dual Core
- 133 MHz CPU Clock
- 246 kbytes RAM
- **Supply Voltage**: 2.0 V ~ 3.6 V
- **Temperature Range**: -20° C ~ 85° C

Specifications

This section covers the hardware and software specifications of RAK11300. It also includes the block diagram of the module showing its interfaces.

Overview

Block Diagram

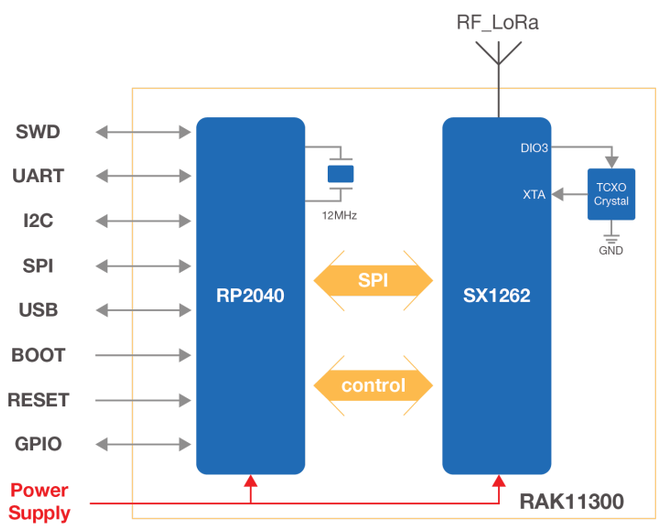

Figure 1: RAK11300 System Block Diagram

Hardware

The hardware specification is categorized into six parts. It shows the interfaces of the module and discusses the pinouts and their corresponding functions and diagrams. It also covers the RF, electrical, mechanical, and

environmental parameters of the RAK11300 WisDuo LPWAN Module.

Interfaces

Module	Interfaces
RAK11300	UART, USB

Pin Definition

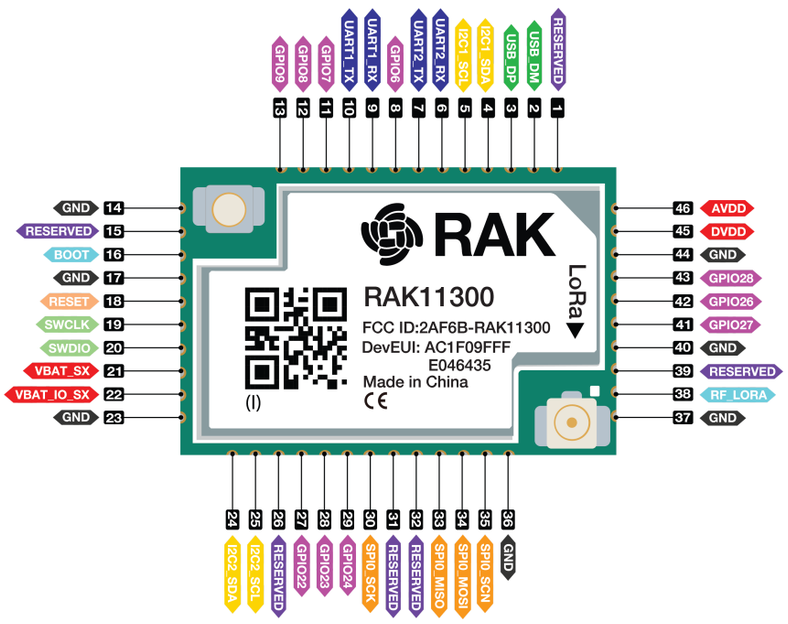

Figure 2: RAK11300 Module Pinout

Pin Description

The table below shows the pin definition and description of RAK11300:

Type	Description
PI	Power Input
PO	Power Output
DI	Digital Input
DO	Digital Output
IO	Bidirectional
AI	Analog Input
AO	Analog Output

Power Supply

Pin Name	Pin No.	Type	Description

Pin Name	Pin No.	Type	Description
VBAT_SX	21	PI	Supply for the LoRa IC
VBAT_SX_IO	22	PI	Supply for the Digital I/O interface pins
DVDD	45	PI	Supply for the MCU
AVDD	46	PI	ADC Reference Voltage
GND	14, 17, 23, 37, 40, 44	Ground	Ground

I2C Interface

Pin Name	Pin No.	Type	Description
I2C1_SDA	4	IO	I2C serial data
I2C1_SCL	5	DO	I2C serial clock
I2C2_SDA	24	IO	I2C serial data
I2C2_SCL	25	DO	I2C serial clock

USB Interface

Pin Name	Pin No.	Type	Description
USB_DM	2	IO	USB differential data(-)
USB_DP	3	IO	USB differential data(+)

UART Interface

Pin Name	Pin No.	Type	Description
UART1_RX	9	DI	UART1 receive
UART1_TX	10	DO	UART1 transmit
UART2_RX	6	DI	UART2 receive
UART2_TX	7	DO	UART2 transmit

SPI Interface

Pin Name	Pin No.	Type	Description
SPI0_SCK	30	DO	SPI clock

Pin Name	Pin No.	Type	Description
SPI0_MISO	33	DI	SPI master input, slave output
SPI0_MOSI	34	DO	SPI master output. slave input
SPI0_CSN	35	DO	SPI chip select

SWD Interface

Pin Name	Pin No.	Type	Description
SWCLK	19	Debug	SWD clock input for debugging and programming
SWDIO	20	Debug	SWD I/O for debugging and programming

RESET

Pin Name	Pin No.	Type	Description
RESET	18	DI	Reset the module, Active Low

Antenna Interface

⚠️ **WARNING**

When using `RF_LoRa` pin for antenna and not the IPEX connector variant, there are design considerations to make sure optimum RF performance.

- RF trace must be away from interference (switching node of DC-DC supply, high current/voltage pulses from controllers of inductive load like motor, signal generators, etc.)
- RF trace must have 50 Ohms impedance. It is advisable to use an impedance simulation software tool to achieve this requirement.
- If using an external antenna connector, make it close to the `RF_LoRa` pin.
- Ground plane optimization is critical on certain antenna types like monopole.
- GND trace used for RF path return must be directly connected to the GND plane and not be treated as thermal relief.
- It is recommended for the RF trace to be routed in a curve and not in a sharp 90 degrees.

In addition, with a commitment to making IoT easy, RAK offers a dedicated service for Antenna RF Design which includes PCB design, tuning, matching, and RF testing.

Pin Name	Pin No.	Type	Description	Comment
RF_LoRa	38	IO	LoRa antenna interface	50 Ω Impedance This pin can't be used on modules with an IPEX connector. If unused, keep this pin open.

ADC and GPIO

Pin Name	Pin No.	Type	Description

Pin Name	Pin No.	Type	Description
GPIO7	11	IO	General-purpose input/output
GPIO8	12	IO	General-purpose input/output
GPIO9	13	IO	General-purpose input/output
GPIO22	27	IO	General-purpose input/output
GPIO23	28	IO	General-purpose input/output
GPIO24	29	IO	General-purpose input/output
GPIO27	41	IO	General-purpose input/output
GPIO26 ADC1	43	IO AI	General-purpose input/output General-purpose ADC interface
GPIO28 ADC0	44	IO AI	General-purpose input/output General-purpose ADC interface

RF Characteristics

The RAK11300 supports two different frequency variations: RAK11300(L) Low Radio Frequency and RAK11300(H) High Radio Frequency.

Operating Frequencies

Module	Region	Frequency
RAK11300(L)	Europe	EU433
	China	CN470
RAK11300(H)	Europe	EU868
	America	US915
	Australia	AU915
	Korea	KR920
	Asia	AS923
	India	IN865
	Russia	RU864

Electrical Characteristics

Recommended Operating Conditions

Symbol	Description	Min.	Nom.	Max.	Unit
VBAT_SX	SX1262 supply voltage	2.0	3.3	3.7	V
VBAT_SX_IO	SX1262 supply for I/O pins	2.0	3.3	3.7	V
DVDD	Power supply of MCU	2.0	3.3	3.6	V
AVDD	ADC Reference Voltage	-	3.3	-	V

Absolute Maximum Ratings

Symbol	Description	Min.	Nom.	Max.	Unit
VBAT_SX	LoRa chip supply voltage	-0.5	-	3.9	V
VBAT_SX_IO	LoRa chip supply for I/O pins	-0.5	-	3.9	V
DVDD	Supply for the MCU	-0.5	-	3.6	
AVDD	ADC Reference Voltage	-0.5	-	3.6	
ESD HBM	Human Body Model	-	-	2000	V
ESD CDM	Charged Device Model	-	-	500	V

Mechanical Characteristics

Module Dimensions

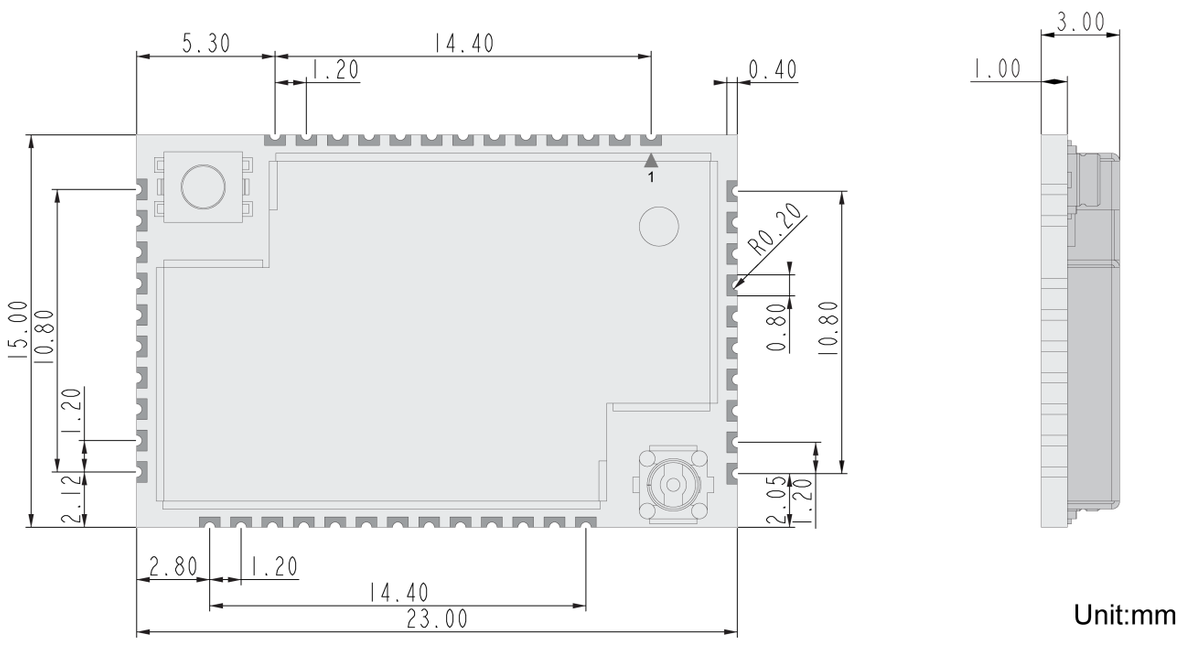

Figure 3: RAK11300 Physical Dimension

Layout Recommendation

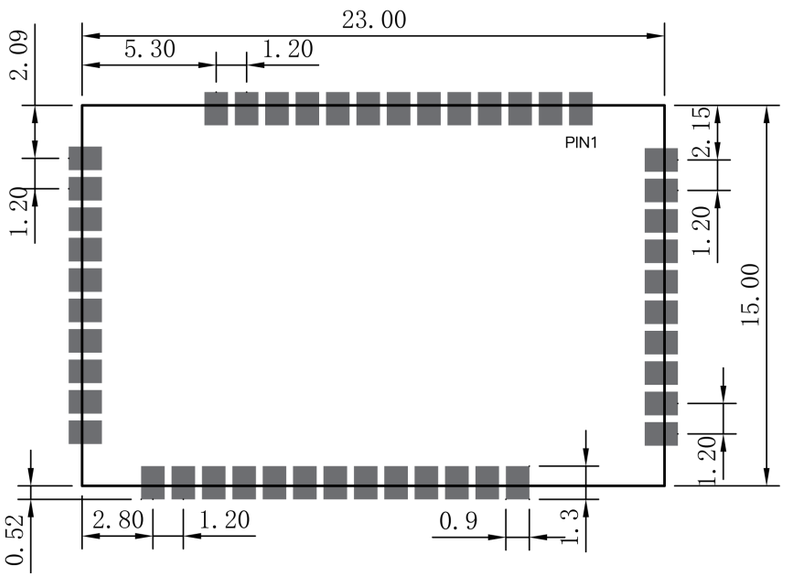

Figure 4: RAK11300 Layout

Environmental Characteristics

Operating Temperature

Feature	Minimum	Typical	Maximum	Unit
Operating Temperature	-20	25	85	°C

Storage Temperature

Feature	Minimum	Typical	Maximum	Unit
Storage Temperature	-20		85	°C

Recommended Reflow Profile

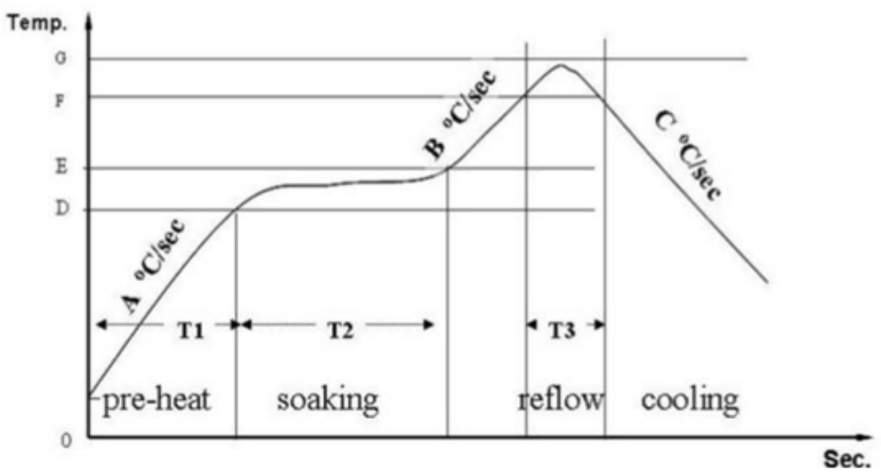

Figure 5: Reflow Profile for RAK11300

Standard conditions for reflow soldering:

- Pre-heating Ramp (A) (Initial temperature: 150° C): **1~2.5° C/sec**
- Soaking Time (T2) (150~180° C): **60~100 sec**
- Peak Temperature (G): **230~250° C**
- Reflow Time (T3) (>220° C): **30~60 sec**
- Ramp-up Rate (B): **0~2.5° C/sec**
- Ramp-down Rate (C): **1~3° C/sec**

Software

Download the latest firmware of the RAK11300 WisDuo LPWAN Module provided below.

Firmware / OS

Model	Version	Source
RAK11300	V1.0.0	Download

Certification

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